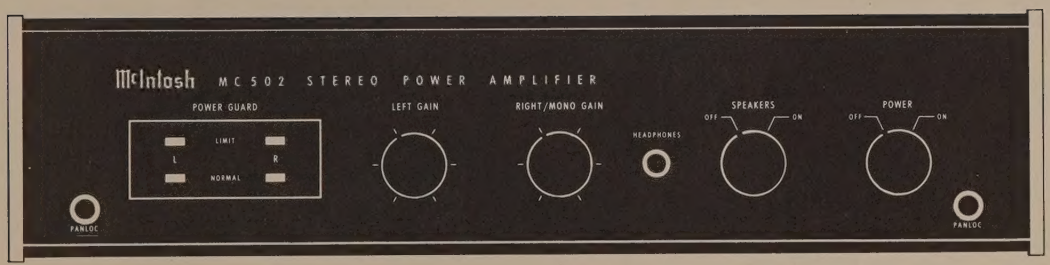
McIntosh

# MC 502
## POWER AMPLIFIER




# SERVICE INFORMATION

STARTING WITH SERIAL NO. CE1001

McINTOSH LABORATORY INC. BINGHAMTON, NEW YORK 13903

039-100

MC502

# PERFORMANCE LIMITS

## PERFORMANCE

### POWER OUTPUT RATING

STEREO-75 watts into 2.7 to 4 ohm loads, 50 watts into 8 ohm loads, minimum sine wave continuous average power output per channel from 20 Hz to 20,000 Hz, both channels operating.

Which is: 14.2 volts RMS across 2.7 ohms
17.3 volts RMS across 4 ohms
20.0 volts RMS across 8 ohms

MONO (Bridged)-150 watts into an 8 ohm load, minimum sine wave continuous average power output from 20 Hz to 20,000 Hz.

Which is: 34.6 volts RMS across 8 ohms

### OUTPUT LOAD IMPEDANCE

STEREO: 2.7 to 8 ohms

MONO: 8 ohms obtained by connecting across the output terminals of both channels.

### RATED POWER BAND

20 Hz to 20,000 Hz

### TOTAL HARMONIC DISTORTION

STEREO: .02% maximum harmonic distortion at any power level from 250 milliwatts to rated power per channel from 20 Hz to 20,000 Hz, both channels operating.

MONO: .02% maximum harmonic distortion at any power level from 250 milliwatts to rated power from 20 Hz to 20,000 Hz.

### INTERMODULATION DISTORTION

STEREO: .02% maximum per channel with both channels operating for any combination of frequencies, 20 Hz to 20,000 Hz.

MONO: .02% maximum at any power level from 250mW to rated power for any combination of frequencies, 20 Hz to 20,000 Hz

### FREQUENCY RESPONSE (at one watt output)

20 Hz to 20,000 Hz, +0 -0.25 dB
10 Hz to 100,000 Hz +0 -3.0 dB

### NOISE AND HUM

95 dB below rated output

## RATINGS

### OUTPUT VOLTAGES

25 volts for distribution lines

### DAMPING FACTOR

Greater than 50

### INPUT IMPEDANCE

75,000 ohms

### INPUT SENSITIVITY

Switchable: 0.75 volt or 2.5 volts-Level control provided for higher input voltages.

## GENERAL INFORMATION

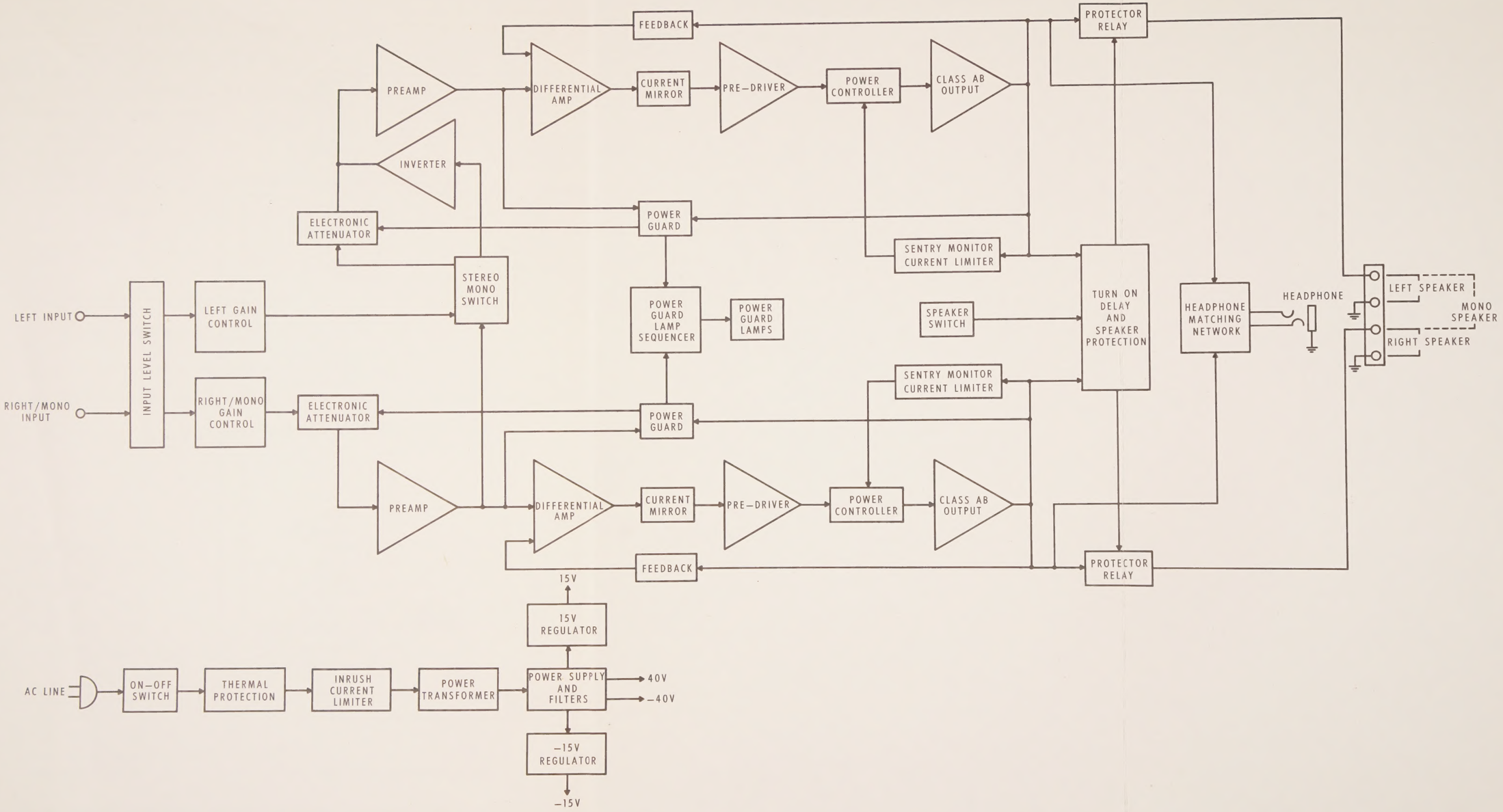
### POWER REQUIREMENTS

120 volts, 50/60 Hz, 0.2 to 4 amperes

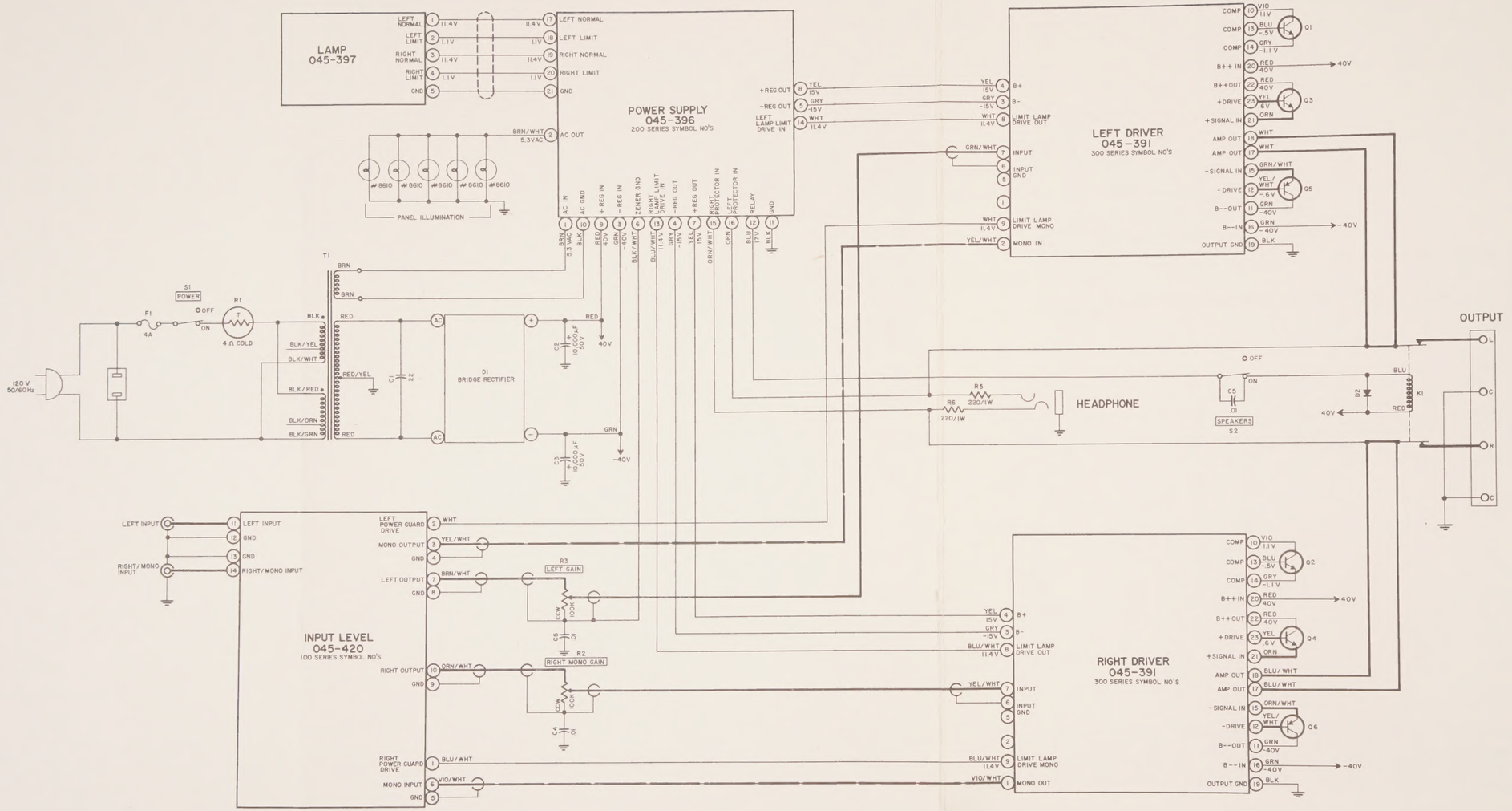
## MECHANICAL INFORMATION

SIZE: Front panel measures 16 inches wide (40.6 cm) by 3-5/8 inches high (9.2 cm). Chassis measures 14-3/4 inches wide (37.5 cm) by 2-3/8 inches high (6 cm) by 14-1/2 inches deep (36.8 cm), including connectors. Knob clearance required is 1-1/4 inches (3.2 cm) in front of mounting panel.

WEIGHT: 27 pounds (12.2 kg) net, 38 pounds (17.2 kg) in shipping carton


FEEDBACK
PROTECTOR RELAY
PREAMP
DIFFERENTIAL AMP
CURRENT MIRROR
PRE–DRIVER
POWER CONTROLLER
CLASS AB OUTPUT
INVERTER
ELECTRONIC ATTENUATOR
POWER GUARD
SENTRY MONITOR CURRENT LIMITER
STEREO MONO SWITCH
LEFT INPUT
INPUT LEVEL SWITCH
LEFT GAIN CONTROL
POWER GUARD LAMP SEQUENCER
POWER GUARD LAMPS
SPEAKER SWITCH
TURN ON DELAY AND SPEAKER PROTECTION
HEADPHONE MATCHING NETWORK
HEADPHONE
LEFT SPEAKER
MONO SPEAKER
RIGHT SPEAKER
RIGHT/MONO INPUT
RIGHT/MONO GAIN CONTROL
ELECTRONIC ATTENUATOR
SENTRY MONITOR CURRENT LIMITER
POWER GUARD
PREAMP
DIFFERENTIAL AMP
CURRENT MIRROR
PRE–DRIVER
POWER CONTROLLER
CLASS AB OUTPUT
FEEDBACK
PROTECTOR RELAY
15V
15V REGULATOR
AC LINE
ON–OFF SWITCH
THERMAL PROTECTION
INRUSH CURRENT LIMITER
POWER TRANSFORMER
POWER SUPPLY AND FILTERS
40V
–40V
–15V REGULATOR
–15V

BLOCK DIAG




INTERCONNECT

# SCHEMATIC NOTES

1. Printed circuit board assemblies are outlined on the schematics by dotted lines. The circled numbers on the dotted lines correspond to the numbers on the printed circuit board layouts.
2. The heavy lines on the schematics denote the primary signal path.
3. The heavy dash lines on the schematics denote a secondary signal path.
4. Unless otherwise specified: Resistance values are in ohms, 1/4 watt, and 5% tolerance. Capacitance values smaller than 1 are in microfarads (μF); capacitance values greater than 1 are in picofarads (pF).
5. All voltages indicated on the schematics are measured under the following conditions:

   Use of an 11 megohm input impedance VTVM. All voltages ± 10% with respect to ground.

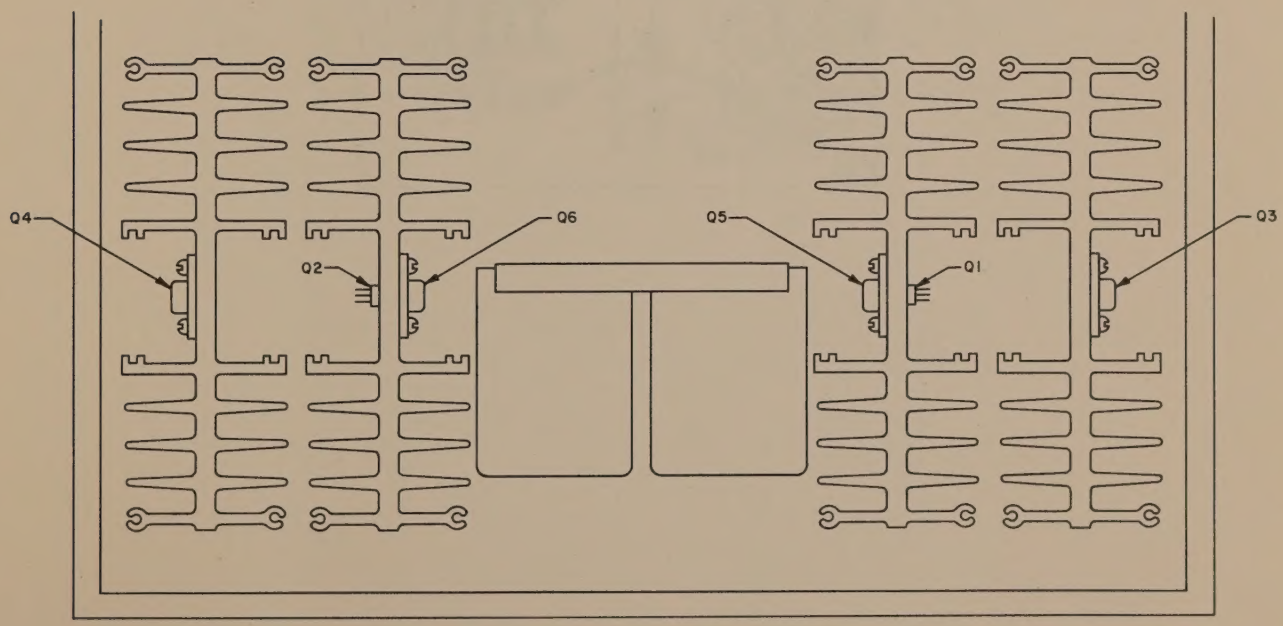
   No signal at input terminals. AC input at 120 volts, 50/60 Hz.

   Voltages not specified are "0" volts.

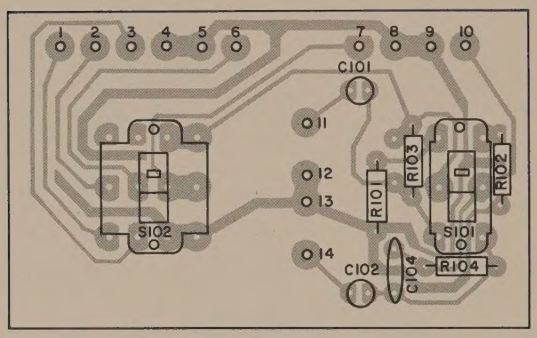
6. Front panel controls at:

| | | Rear panel switches at: | |
|---|---|---|---|
| Power | On | Input Level | 2.5 V |
| Speakers | On | Mode | Stereo |
| Left Gain | ccw | | |
| Right/Mono Gain | ccw | | |

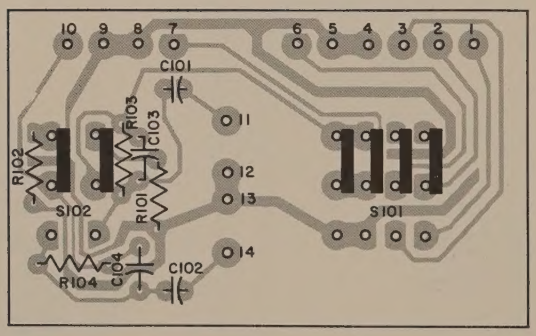
7. Bias adjustment:
   a. Operate amplifier at high power (approximately 50 watts) for about 2 minutes to warm the amplifier.
   b. Remove the input signal and turn R351 and R352 controls full ccw. Bias must be adjusted soon after the input signal is removed while the amplifier is still hot.
   c. Measure the line input power (approximately 25 watts) or current (approximately 0.2A).
   d. Rotate R351 bias control cw until the line input increases by 3.5 watts or 0.03 amps.
   e. Rotate R352 bias control cw until the line input increases by an additional 3.5 watts or 0.03 amps.

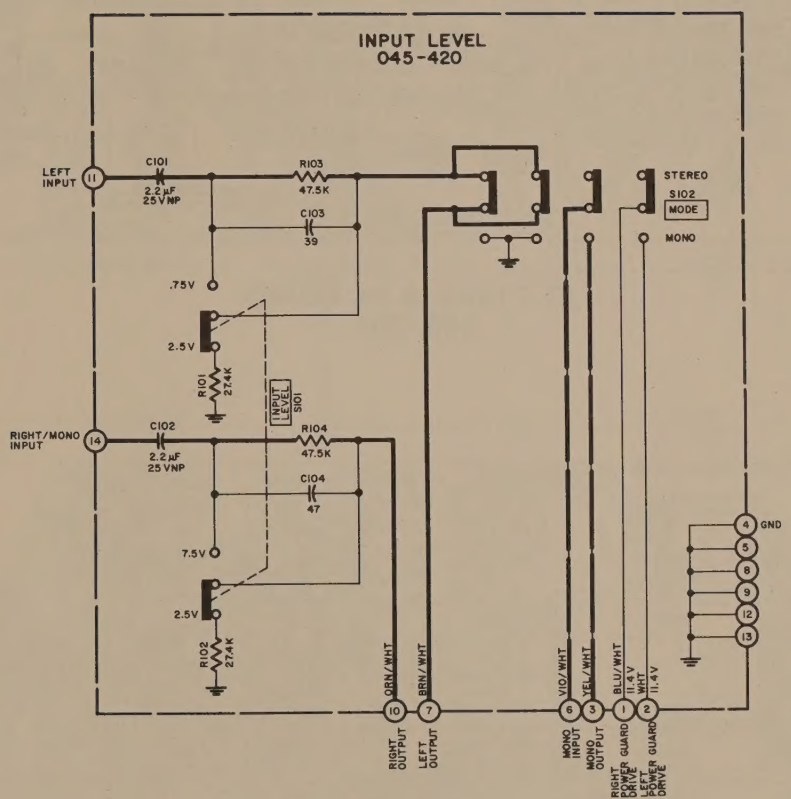


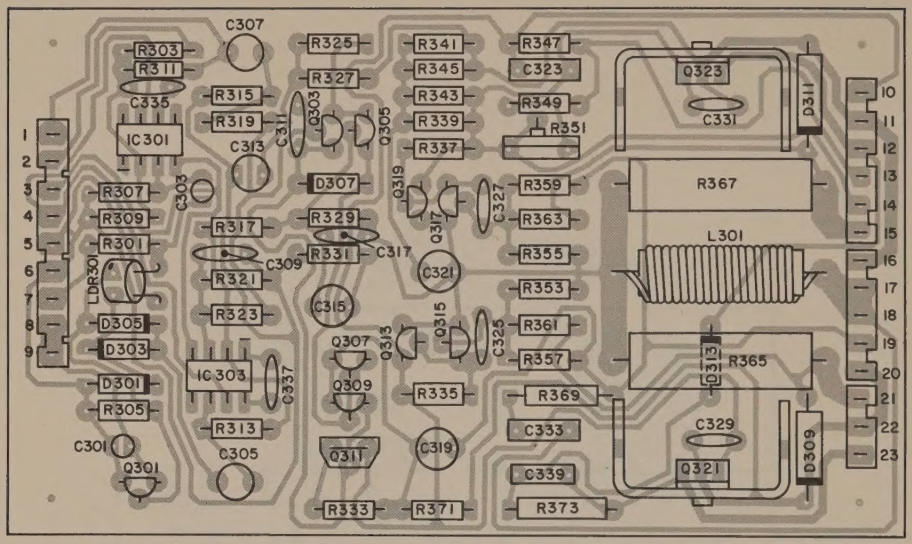

TOP—REAR
LOCATION OF TRANSISTORS NOT ON PC BOARDS



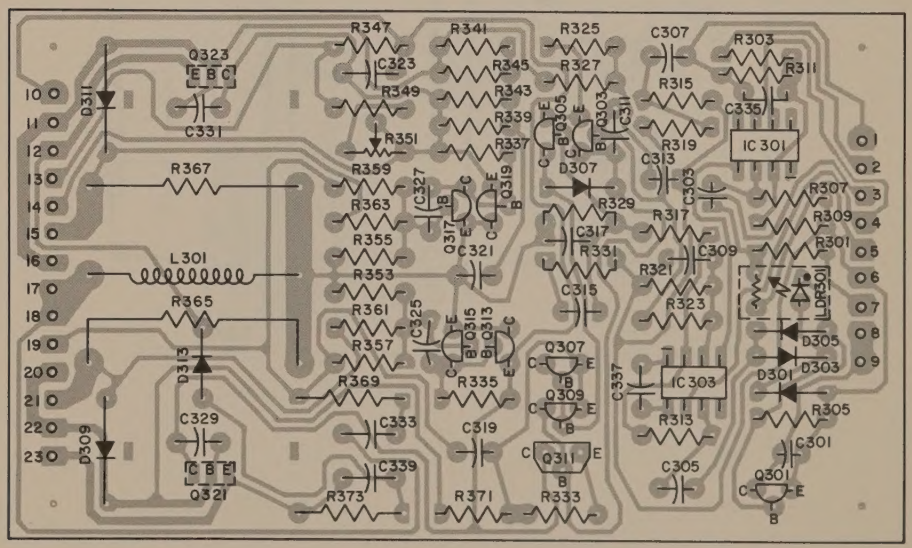

INPUT LEVEL PC BOARD
045420




INPUT LEVEL
045-420
LEFT INPUT
11
C101
2.2 µF
25 VNP
R103
47.5K
C103
39
.75V
2.5V
R101
27.4K
INPUT LEVEL
S101
RIGHT/MONO INPUT
14
C102
2.2 µF
25 VNP
R104
47.5K
C104
47
7.5V
2.5V
R102
27.4K
STEREO
S102
MODE
MONO
GND
4
5
8
9
12
13
ORN/WHT
BRN/WHT
VIO/WHT
YEL/WHT
BLU/WHT
11.4V
WHT
11.4V
10
7
6
3
1
2
RIGHT OUTPUT
LEFT OUTPUT
MONO INPUT
MONO OUTPUT
RIGHT POWER GUARD DRIVE
LEFT POWER GUARD DRIVE




LEFT DRIVER PC BOARD
045-391



LEFT DRIVER
045-931

INPUT 7 GRN/WHT
MONO IN 2 YEL/WHT
INPUT GND 5 6
LIMIT LAMP DRIVE OUT 8 WHT 11.4V
LIMIT LAMP DRIVE MONO 9 WHT 11.4V
B+ 4 YEL 15V → 15V
B- 3 GRY -15V → -15V

R301 10K
R303 10K 1%
C303 .47 50V
R307 330K
R309 2.87K 1%
R311 10K 1%
C335 100
IC 301
15V
-15V
C307 22µF
R315 3.3K
R319 1K
LDR301
D301
D303
D305
C305 10µF 35V NP
Q301 11.4V
R305 5.6K
C301 47 50V
IC 303
C337 1.8
-13.8V
-15V
R313 1.5M
R317 39K
R321 220K
C309 22

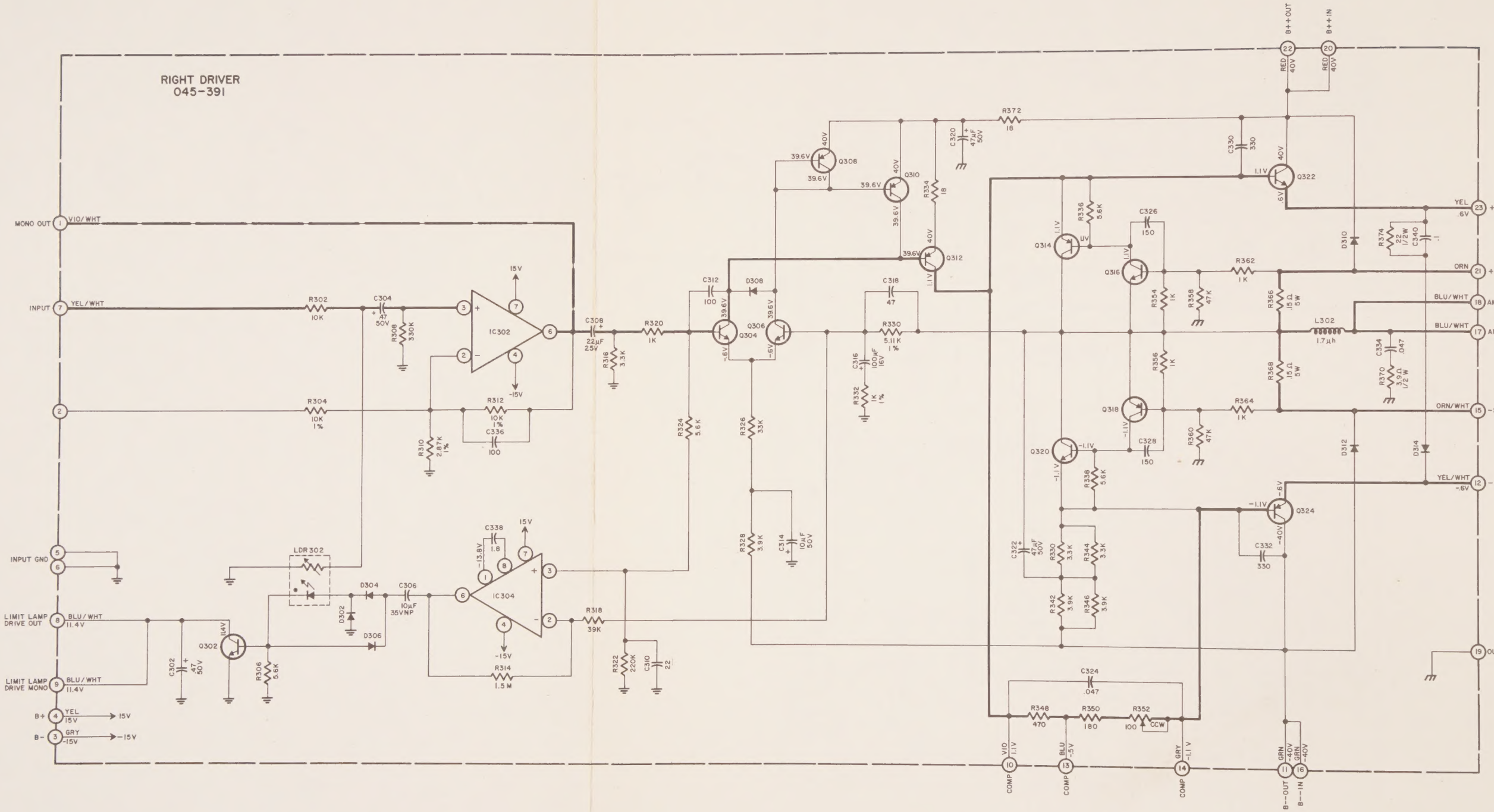
C311 100
D307
Q305 Q303
39.6V
-6V
R323 5.6K
R325 33K
C315 100µF 16V
R331 1K 1%
C317 47
R329 511K 1%
Q307 Q309 Q311
40V
39.6V
R333 18
C319 47µF 50V
R327 3.9K
C313 10µF 50V

R371 18
C329 330
Q321
1.1V
6V
R335 5.6K
Q313
1.1V
0V
C325 150
Q315
R353 1K
R357 47K
R361 1K
R365 .15Ω 5W
D309
R373 22 1/2W
C339 .1
L301 1.7µh
C333 .047
R369 3.9Ω 1/2W
R355 1K
R367 .15Ω 5W
Q317
-1.1V
R363 1K
C327 150
R359 47K
Q319
-1.1V
R337 5.6K
D311
D313
Q323
-1.1V
-6V
-40V
C331 330
C321 47µF 50V
R339 3.3K
R343 3.3K
R341 3.9K
R345 3.9K
C323 .047
R347 470
R349 180
R351 100 CCW

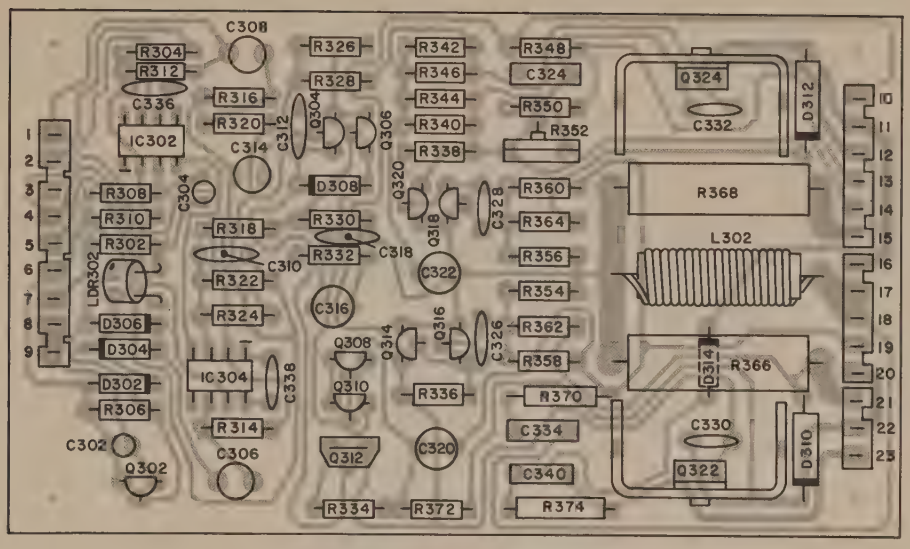
B++ OUT 22 RED 40V
B++ IN 20 RED 40V
YEL .6V 23 +DRIVE
ORN 21 +SIGNAL IN
WHT 18 AMP OUT
WHT 17 AMP OUT
ORN/WHT 15 -SIGNAL IN
YEL/WHT -.6V 12 -DRIVE
19 OUTPUT GND
VIO 11V 10 COMP
BLU -.5V 13 COMP
GRY -1.1V 14 COMP
GRN -40V 11 B-- OUT
GRN -40V 16 B-- IN

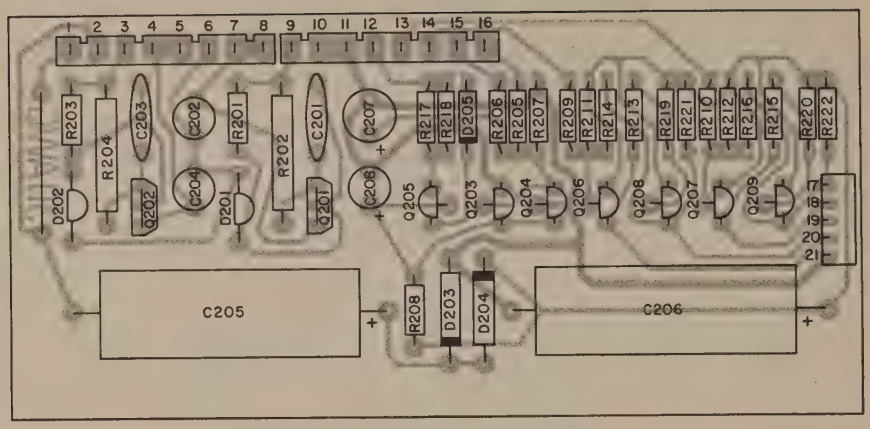
LEFT CHANNEL DRIVE

RIGHT DRIVER
045-391

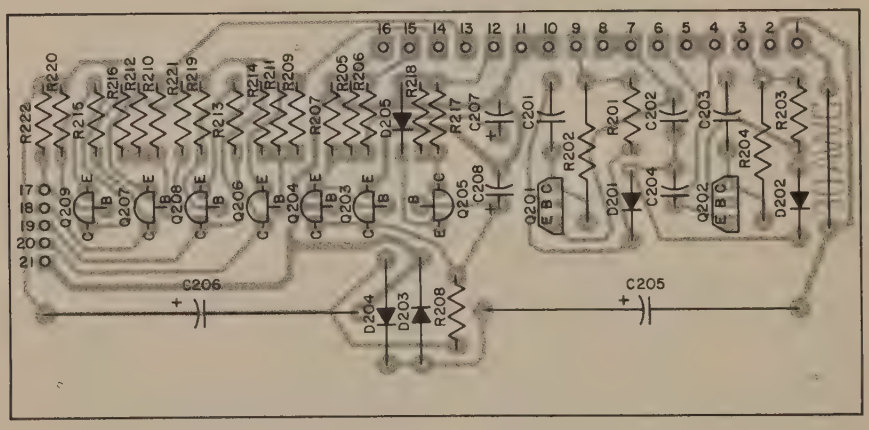


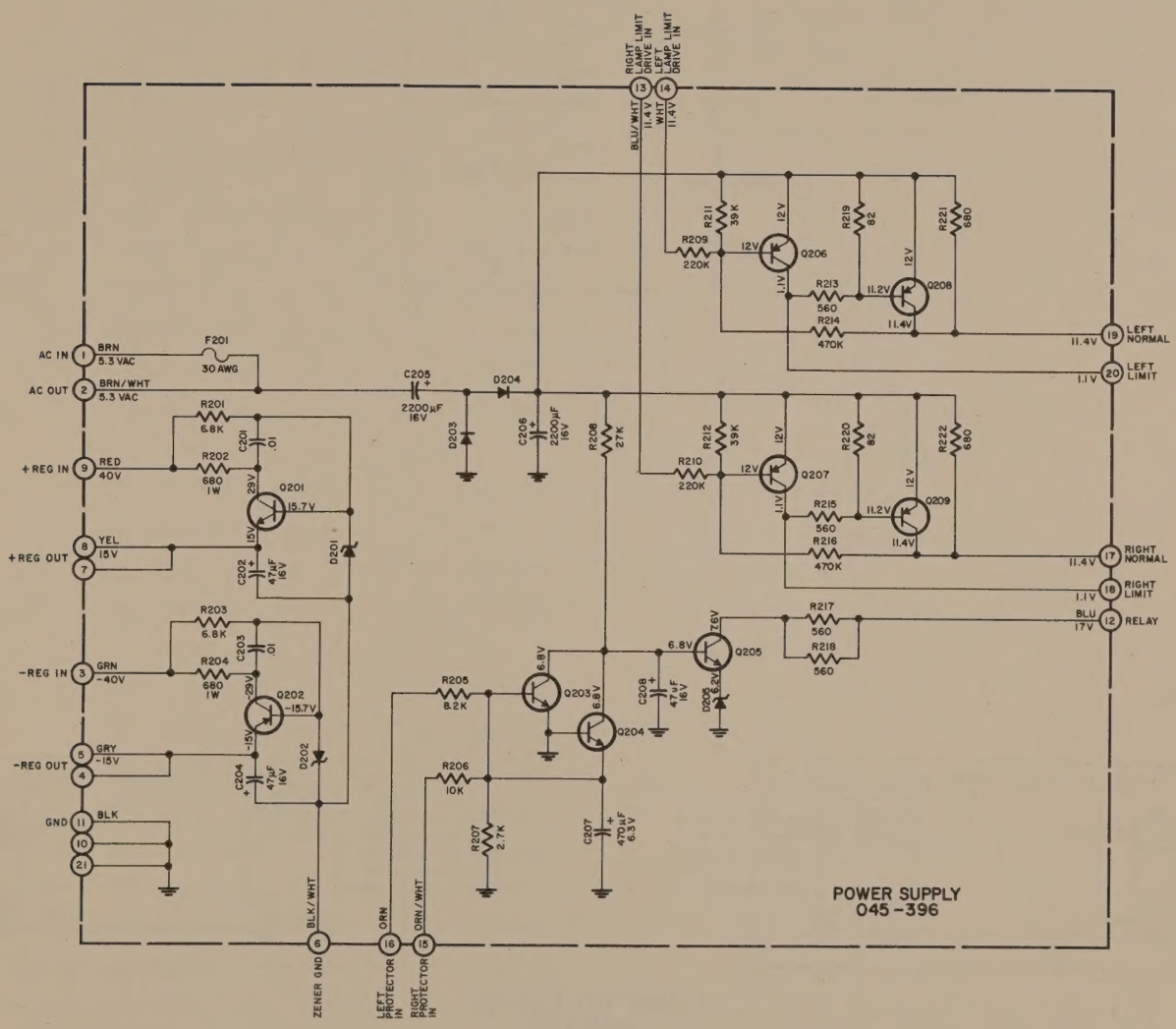

RIGHT CHANNEL DRIVER

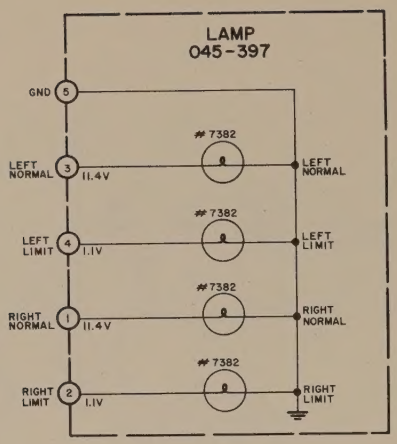

C308
R304
R312
C336
IC302
C314
R316
R320
C312
Q304
Q306
R326
R328
R342
R346
R344
R340
R338
R348
C324
R350
R352
Q324
C332
D312
R368
L302
R366
Q314
C330
Q322
D310
R308
R310
R302
LDR302
C304
R318
C310
R322
R324
D306
D304
D302
R306
C302
Q302
C306
IC304
C338
D308
R330
R332
C318
Q318
C322
Q320
C328
R360
R364
R356
R354
R362
R358
C326
Q316
Q314
R370
C334
C340
R374
Q308
Q310
Q312
C316
R336
C320
R372
R334
R346
C324
R350
C328
R364
C326
R358
R370
C334
C340
R374
R372
C330
Q322
D310
C338
C310
C320
Q312
R336
R334
C306
R314
IC304
D402
D304
D306
LDR402
R310
R302
C302
Q302
R306
IC 302
C336
R312
R304
C308
R316
R320
C314
C304
R308
R318
C310
R322
R324
C316
C318
R332
R330
D308
Q308
C310
Q312
Q306
C312
Q304
Q320
C328
Q318
C322
Q316
Q314
C326
R328
R326
R342

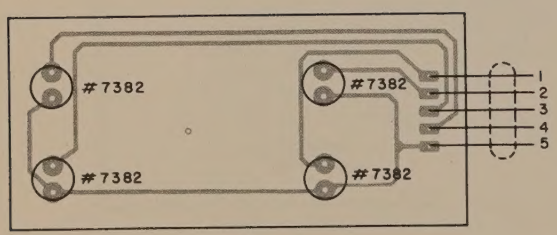


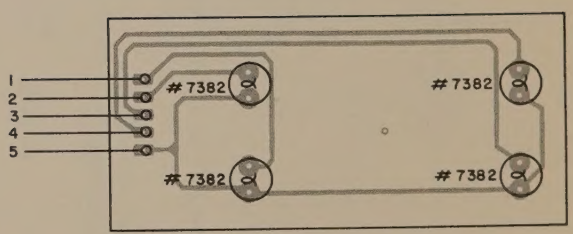

POWER SUPPLY PC BOARD
045396




RIGHT LAMP LIMIT DRIVE IN
LEFT LAMP LIMIT DRIVE IN
13
14
BLU/WHT 11.4V
WHT 11.4V
AC IN
1
BRN 5.3 VAC
F201 30 AWG
AC OUT
2
BRN/WHT 5.3 VAC
C205 2200µF 16V
D204
D203
C206 2200µF 16V
R208 27K
+REG IN
9
RED 40V
R201 6.8K
R202 680 1W
C201 .01
Q201 15.7V
23V
15V
+REG OUT
8
7
YEL 15V
C202 47µF 16V
D201
-REG IN
3
GRN -40V
R203 6.8K
R204 680 1W
C203 .01
Q202 -15.7V
-23V
-15V
-REG OUT
5
4
GRY -15V
C204 47µF 16V
D202
GND
11
10
21
BLK
BLK/WHT
ORN
ORN/WHT
6
16
15
ZENER GND
LEFT PROTECTOR IN
RIGHT PROTECTOR IN
R209 220K
R211 39K
Q206
R213 560
R214 470K
R219 82
Q208
R221 680
12V
11.2V
11.4V
1.1V
19
LEFT NORMAL
20
LEFT LIMIT
1.1V
R210 220K
R212 39K
Q207
R215 560
R216 470K
R220 82
Q209
R222 680
17
RIGHT NORMAL
18
RIGHT LIMIT
R205 8.2K
Q203
Q204
6.8V
R206 10K
R207 2.7K
C207 470µF 6.3V
C208 47µF 16V
D205 6.2V
Q205
7.6V
R217 560
R218 560
BLU 17V
12
RELAY
POWER SUPPLY
045-396




LAMP PC BOARD
045397

# REPLACEMENT PARTS

All parts not listed are common items obtainable from radio parts jobbers.

Replacement parts may be obtained when ordered by PART NUMBER from:

McIntosh Laboratory, Inc.
Customer Service Department
2 Chambers Street
Binghamton, New York 13903
(Telephone 607-723-3512)

| Symbol Number | Description | Part Number |
|---|---|---|
| | **DIODES** | |
| D2 | Si. signal diode | 070-031 |
| D201,202 | Zener diode | 070-089 |
| D203,204 | Si. signal diode | 070-031 |
| D205 | Zener diode | 070-085 |
| D301,302 | Si. signal diode | 070-047 |
| D303,304 | Si. signal diode | 070-047 |
| D305,306 | Si. signal diode | 070-047 |
| D307,308 | Si. signal diode | 070-047 |
| D309,310 | Si. signal diode | 070-031 |
| D311,312 | Si. signal diode | 070-031 |
| D313,314 | Si. signal diode | 070-098 |
| | **CAPACITORS** | |
| C2,3 | Elect. Cap. 10000μF 50V | 066-249 |
| | **INTEGRATED CIRCUITS** | |
| IC301,302 | Integrated circuit | 133-066 |
| IC303,304 | Integrated circuit | 133-068 |
| | **TRANSISTORS** | |
| Q1,2 | Si. NPN Transistor | 132-143 |
| Q3,4 | Si. NPN Power transistor | 132-188 |
| Q5,6 | Si. PNP Power transistor | 132-189 |
| Q201 | Si. NPN transistor | 132-149 |
| Q202 | Si. PNP transistor | 132-148 |
| Q203,204 | Si. NPN transistor | 132-143 |
| Q205 | Si. NPN transistor | 132-185 |
| Q206,207 | PNP Darlington | 132-182 |
| Q208,209 | Si. PNP transistor | 132-150 |
| Q301,302 | Si. NPN transistor | 132-092 |
| Q303,304 | Si. NPN transistor | 132-185 |
| Q305,306 | Si. NPN transistor | 132-185 |
| Q307,308 | Si. PNP transistor | 132-096 |
| Q309,310 | Si. PNP transistor | 132-096 |
| Q311,312 | Si. PNP transistor | 132-148 |
| Q313,314 | Si. PNP transistor | 132-150 |
| Q315,316 | Si. NPN transistor | 132-143 |
| Q317,318 | Si. PNP transistor | 132-150 |
| Q319,320 | Si. NPN transistor | 132-134 |
| Q321,322 | NPN medium power | 132-183 |
| Q323,324 | PNP medium power | 132-148 |
| | **RESISTORS** | |
| LDR301,302 | LED photoresistor | 144-070 |
| | **SWITCHES** | |
| S1 | Power switch | 146-204 |
| S2 | Speaker switch | 146-204 |
| | **POTENTIOMENTS** | |
| R2 | Right/Mono gain | 134-363 |
| R3 | Left gain | 134-363 |
| | **TRANSFORMERS** | |
| T1 | Power transformer | 045-430 |
| | **FUSES** | |
| F1 | Fuse 4A | 089-022 |
| | **RELAYS** | |
| K1 | Relay DPDT | 087-019 |
| | **CHOKES** | |
| L301,302 | Choke 1.7μH | 122-188 |
| | **LAMPS** | |
| | Power guard #7382 | 058-061 |
| | Front panel #8610 | 058-069 |
| | **FRONT PANEL & TRIM** | |
| | Front panel | 045-428 |
| | Front panel glass | 016-172 |
| | End cap | 018-204 |
| | Power knob | 090-156 |
| | Speaker knob | 090-156 |
| | Right/mono gain knob | 090-156 |
| | Left gain knob | 090-156 |
| | **MISCELLANEOUS** | |
| | Fuseholder | 178-106 |
| | AC power cord | 170-119 |
| | Shipping carton | 045-454 |
| | Hardware package | 045-427 |
| | Panel lamp grommet | 078-005 |
| | 6' audio cable | 170-015 |

C502